

UNITED STATES PATENT APPLICATION

Title: SCANNING DEVICE

Applicants: Chuan-Yu HSU; Jer-Kuei MAI

Attorney for Applicant:

Peter F. Corless (Reg. No. 33,860)
Dike, Bronstein, Roberts & Cushman
Intellectual Property Group
EDWARDS & ANGELL, LLP
P.O. Box 9169
Boston, MA 02209

SCANNING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to scanning devices, and more particularly, to a
5 scanning device for scanning image information on a document disposed thereon.

2. Description of Related Art:

Fig. 1 illustrates a simplified schematic diagram of a conventional scanner,
in which a rectangular body depicted by dotted lines represents a casing 100 of the
10 scanner.

On the top side of the casing 100 there is fitted a transparent panel such as
glass (not shown), and inside the casing 100 there is mounted a chassis 10 capable
of sliding back and forth along a slide lever 9 under the transparent panel, so as to
scan a document or a graph placed on the transparent panel by means of a
15 photoelectric transforming device 12, e.g. a CCD (charge coupled device) or CIS
CMOS (complementary metal oxide semiconductor). As shown in Fig. 1, on the
chassis 10 there is installed a first circuit board 14, while the aforementioned
photoelectric transforming device 12 is mounted on one side of the circuit board 14
that is enclosed in the chassis 10.

Furthermore, even though not shown in Fig. 1, the first circuit board 14 is
20 electrically connected with a second circuit board 20 installed at the rear of the
casing 100 (left in Fig. 1) by means of a wire bank 15 in order to receive instructions
for scanning and to send out image data obtained in the scanning operation through
the second circuit board 20. Besides, a third circuit board 30 at the front of the
25 casing 100 (right in Fig. 1) is also electrically connected with the second circuit

board 20 by means of connectors 31, 32, and a wire bank 33 electrically interconnecting the connectors 31, 32. As shown in Fig. 1, the third circuit board 30 includes a plurality of switching devices 34 thereon such as push switches, and the casing 100 has a corresponding plurality of push-keys 40 so as to allow a user to
 5 give to the scanner instructions such as scan, copy, or fax directly by using the push-keys 40.

Even though generally in a scanner software interface at the computer end is provided for a user to give instructions to the scanner, extra push-keys 40 installed on the casing 100 provide users with operational convenience such as single key-
 10 scan. Therefore, most of the scanners still retain the aforementioned push-keys for user's direct operation.

However, the third circuit board 30 is provided merely for the electrical connection between the push keys 40 and the first circuit board 14 via the second circuit board 20, so as to have the photoelectric transforming device 12 perform
 15 scanning operation. As a result, the third circuit board 30, the two connectors 31 and 32, and the wire bank 33 are additionally required for the provision of the push - keys 40 for users. This not only increases the number of components but also complicates assembly procedures of the conventional scanner. Therefore, the aforementioned conventional scanner is cost-ineffective and time-consuming to
 20 manufacture.

Furthermore, as illustrated in the drawing, since the aforementioned wire bank 33 has to be extended from the front end to the rear end of the scanner, it is long in length. As a result, when in operation, EMI (electromagnetic interference) problems will result in the wire bank 33 so that the electrical performance of the
 25 scanner is adversely affected. To prevent EMI from incurrence, EMI cores (not

shown) are always required. This nevertheless increases the manufacturing cost and assembly time for the scanner.

SUMMARY OF THE INVENTION

5 The primary objective of the present invention is to provide a scanning device that is cost-effective to manufacture when compared to the prior art.

Another objective of the present invention is to provide a scanning device that allows a saving of assembling working-hours.

10 In order to achieve the above and other objectives, the present invention provides a scanning device including a casing, a chassis slidably mounted in the casing, a circuit board installed on the chassis with a photoelectric transforming unit for performing image scanning mounted on a first side of the circuit board enclosed in the chassis and a plurality of switching unit formed on a second side of the circuit board exposed to the chassis, and a plurality of push-keys installed on the
15 casing for being cooperative with the plurality of the switching units when the chassis is at a position that allows the switching units to be in contact with the push-keys.

As such, the switching units can be directly pressed by the push-keys when the push-keys are in contact with the switching units and are being pressed by a
20 user. Therefore, the photoelectric transforming unit is activated responsive to the movement of the switching units by the push-keys, thereby no additional circuit board used to accommodate the switching units and no additional wire bank for electrically connecting the circuit board and the push-keys. This allows the scanner device of the present invention to be cost-effectively manufactured and easily
25 assembled.

BRIEF DESCRIPTION OF DRAWINGS

The scanning device of the present invention can be fully understood by reading the following detailed description of the preferred embodiments, with reference made to the accompanying drawings, wherein:

- 5 Fig. 1 is a schematic structural view of a conventional scanner;
- Fig. 2 is a partially sectional view of an embodiment of the scanner device in accordance with the present invention;
- Fig. 3 is a partially sectional view of another embodiment of the scanner device in accordance with the present invention; and
- 10 Fig. 4(A) is a partially sectional view of still another embodiment of the scanner device in accordance with the present invention and Fig. 4(B) is a front view of the switching unit shown in Fig. 4(A).

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

- 15 As shown in Fig. 1, in the conventional scanner, the chassis 10 is allowed to move in the casing 100 from a first position where the chassis 10 is positioned proximate to the push-keys 40, to a second position where the chassis 10 is positioned proximate to the second circuit board 20. Besides, the push-keys 40 represent instructions for scan, copy, and fax, respectively.

- 20 The basic structure of the scanner device of the present invention is the same as that illustrated in Fig. 1. Therefore, structural components of the scanner device of this invention identical to those indicated in Fig. 1 are labeled with the same numeral references.

- Referring to Fig. 2, the scanner device of the present invention has switching
- 25 units 16 installed on a second side of the circuit board 14 that includes the photoelectric transforming unit 12 mounted on a first side of the circuit board 14. A plurality of push-keys 41 are provided on the casing 100 in a manner that each of the

push-keys 41 is corresponding in position to each of the switching units 16. As shown in Fig. 2, when the chassis 10 is positioned at the first position, the push-keys 41 are each in contact with the switching units 16 for allowing the switching units 16 to be cooperative with the push-keys 41. Therefore, when the push-keys 41 are pressed by a user, the switching units 16 are synchronously pressed by the corresponding push-keys 41 to thereby activate the photoelectric transforming unit 12 to perform image scanning. At the same time, the chassis 10 is driven to move from the first position to the second position by a driving motor (not shown), making the switching units 16 to disengage from the push-keys 41. As the association of the driving motor and the chassis 10 as well as the driving motor itself are conventional, detailed description thereto is omitted here.

As shown in Fig. 2, because the push-key 41 is installed on a top wall of the casing 100 over the chassis 10, conventional push-button switches can be used as the switching units 16. Each of the switching units 16 is formed with a push-button 162 parallel to the plane of the circuit board 14, so that a pressing portion 412 that extends downwardly from the bottom of the push-key 41 can act on the push-button 162 when the push-key 41 is pressed by an external force. Each of the push-keys 41 also has a pair of outwardly extending resilient flanges 414 that are coupled to the casing 100 by means of bolts 102 formed on the casing 100.

Fig. 3 shows another preferred embodiment of the present invention, wherein a push-key 42 is movably mounted on a side wall of the casing 100, and a switching unit 17 in the form of a push-button switch is protruded from the circuit board 14, to be cooperative with the push-key 42. As a result, a push-button 172 formed on the switching unit 17 is perpendicular to the plane of the circuit board 14. As such, when the push-key 142 is pressed by an external force, a downwardly extending pressing portion 422 of the push-key 42 pressingly acts on the push-button 172. The

mounting of the push-key 42 to the casing 100 is the same as that of the push-key 41 illustrated in the above, and therefore the description thereto will hereby be omitted.

Referring to Fig. 3, on the circuit board 14 there is also provided a home sensor 18 which can detect whether the chassis 10 is positioned at first position or not. The home sensor 18 can be an optical sensor or a mechanical sensor so as to sense a positioning plate 104 integrally formed on the casing 100.

Furthermore, the push-key and switching units in the preferred embodiment illustrated in Fig. 3 can also be of the configuration shown in Fig. 4(A). As shown in Fig. 4(A), the switching units 19 are in the form of conductive contact pad (as shown in Fig. 4(B)) attached to the circuit board 14, and at the end of a push-key 43 opposing the switching unit 19 there is provided with a conductive rubber 432. As such, when the push-key 43 is pressed, the switching device 19 is in contact with the conductive rubber 432.

The aforementioned are only exemplarily preferred embodiments of the present invention. The scope of the claims as to be stated below should be accorded to the broadest interpretation so as to encompass various modifications and similar arrangements made without violation of the basic principle and technology of the present invention.